A BRAIN TUMOR INVOLVING THE SUPERIOR PARIETAL CONVOLUTION; TWO OPERATIONS FOR ITS REMOVAL; PARTIAL SUCCESS, WITH SOME RELIEF OF SYMPTOMS; DEATH TWO YEARS LATER; AUTOPSY.[1]

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Clinical Summary. *Man of good habits, aged fifty-six years; neurasthenic symptoms for one year; then during four years frequent attacks of Jacksonian epilepsy, initial convulsive movements beginning in the left great toe; general symptoms of brain tumor appear only after these attacks had been present for two years; two operations; tumor only partly removed because of hemorrhage; partial relief; death five years after onset and two years after the operation. Autopsy: A large spindle-celled sarcoma in the right superior parietal convolutions and adjacent mesial convolutions.*—J. H., a man, aged fifty-six years, a druggist, had always enjoyed good health until the spring of 1898. His family and personal history were negative; he denied specific disease. No history of traumatism.

In the spring of 1898 he felt tired and often complained of weariness. Slumber refreshed him much less than formerly, being often disturbed by dreams. He often sung in his sleep. The patient frequently remarked that he "could not keep up with the procession." These neurasthenic symptoms continued until February, 1899 (*i. e.*, about one year), when, without the slightest warning, he was seized with an attack as follows:

His left great toe felt as though in a "cramp." This sensation continued for five minutes, when he sat down. By this time the foot began to twitch. This also continued five minutes. Then convulsive movements began to ascend the body, involving, in the order named, the muscles of the left side of the trunk, the neck, causing here a sense of choking, and, finally, the muscles of the chest and neck, especially those of the right side, the head moving forward and backward, striking with force against the floor. These convulsive movements were maintained without intermission from 1.30 to 5 P.M., when they ceased for a time. Soon there was a resumption of the movements in the left trunk, which, with intermissions, were kept up until 2 A.M. the next day. He was conscious throughout the attack, at times engaging in conversation. The arm and face were at no time involved in convulsive movements. During the attack he experienced a peculiar sensation in the left leg "like electricity going through it."

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[1] A paper read before the Allegheny County (Pa.) Medical Society, November 17, 1903.

Following this seizure, moderate but distinct loss of power in the left arm and leg were noted by the patient. He stayed in bed more or less for a period of three weeks, when he felt as well as ever, except for a certain loss of control of the left arm and some "clumsiness" of the left leg. Four weeks after this attack he was in better health than at any subsequent period.

Five weeks after the attack just described a second occurred; and this was followed by a third, fourth, and fifth seizure, the intervals between them being from ten to fifteen days. These attacks lasted from ten to twenty minutes each, and always began by twitchings in the left great toe, which marched up the leg, thigh, and trunk, as in the first attack. In no seizure was the face or arm involved in convulsive movements; but the latter felt numb and weak during the attack.

Now several attacks occurred in which the entire left leg was at once involved in convulsive movements. In a few attacks the muscles of the calf or thigh seemed to be first involved

Since the first dozen attacks they have occurred at irregular intervals of from ten days to six weeks up to the time of the operation. The great majority of all these seizures began by convulsive movements in the left great toe; although others occurred in which the muscles of the entire left leg were apparently simultaneously involved.

Usually (not always) the patient could predict an attack from a few minutes to twenty-four hours in advance by a peculiar sensation in the leg. After each attack the left arm and leg were weak for a time; but usually recovered within the ensuing five or six days. Convulsive movements ceased in all muscles simultaneously.

His consciousness was entirely preserved throughout all the seizures. The left arm and face were never involved in the convulsive movements. The eyes never turned to one or the other side during a seizure.

The patient had never had headache, vomiting, vertigo, loss of vision, diplopia, or disturbance of hearing.

The last attack before the operation occurred in the latter part of April, 1901, and about twenty-six months after the initial seizure.

He went to bed complaining of a great sense of weariness and fell into an unusually heavy sleep. The next day he complained of severe headache located in the occiput. The next night he was taken with a severe seizure of the usual type while on the street. For thirty-six hours following he was dull, stupid, restless, delirious. The second evening after this attack, when he was examined by Drs. Montgomery, Stieren, and myself, he was still somewhat dull and clouded mentally; but when aroused he recognized members of his family and conversed a little. Palsy of the right third nerve was apparent, as evidenced by a dilated pupil, external squint, and ptosis in the right eye. Dr. Stieren discovered optic neuritis of the right eye and an appearance suggestive of this condition in the left eye.

Close questioning of members of the family developed the fact that the patient was believed to have undergone moderate but progressive mental deterioration since the first convulsion, as evidenced chiefly by a growing lack of interest in affairs, dulling of perception, a lessened sense of responsibility, and a considerable loss of self-reliance. It also developed that the patient had suffered a progressive loss of power in the left arm and leg, aside from the temporary losses following the seizures.

Examination, May 16, 1901. There is in the median line of the skull posteriorly, about four or five inches anterior to the inion, two inches posterior to the Rolando fissure, a bony protuberance, which his wife believes has grown during the last few years.

The mental condition is one of mild, moderate dementia. Memory is fairly good. He is somewhat careless in his habits. His interest in affairs has diminished. He does not read, go to church, etc., as formerly.

Muscular Sense and Stereognostic Appreciation. He recognizes objects placed within either hand readily. Stereognostic appreciation by his feet seems equal. Fingers of left hand, placed in various positions, are not correctly reproduced in right hand.

Special Senses. Hearing and eyesight normal. Taste normal.

Eyes. No apparent extraocular palsy. He moves his eyes in all directions readily. Pupils equal; they react moderately but promptly to light and also to accommodation.

Sensation. Temperature sense, normal; tactile, normal; pain, normal.

Motion. Grasp of left arm distinctly less than that of the right, probably about one-third less. There is about the same degree of loss of power in the left leg.

Reflexes. Knee-jerks: right is normal; left is greatly increased. Ankle clonus absent on both sides. Plantar reflexes on both sides are very active. Babinski sign absent on both sides. Cremaster reflex present on both sides. Abdominal reflex absent on both sides. Biceps-jerk: absent on right side; present on left side. Triceps-jerk: left, absent; right, absent also. Scapular reflex not obtainable.

Percussion. No difference in percussion note over the skull. More pain is produced over the protuberance on the skull previously mentioned than elsewhere.

Viscera. Heart, lungs, and liver normal. Pulse 100.

Diagnosis. A tumor of unknown character in the superior Rolandic region of the right side involving the leg centre.

Operation, May 20, 1901, by Dr. R. W. Stewart, at the Mercy Hospital.

It was proposed to make an opening, the centre of which should be over the right superior parietal convolution, just behind the Rolandic fissure and as near to the median line as possible; but when the flap of scalp was turned back, the long protuberance already referred to became very striking; and here the bone was found to be very thin, soft, and evidently diseased; so it was hastily concluded to make the opening at this point—*i. e.*, about one inch directly posterior to the point at first intended. This bony protuberance proved to be soft, spongy, thin, eroded skull, very dark in color, which was readily removed. The healthy dura beneath was incised when a tumorous mass was readily made out. But with beginning attempts to remove it the patient fell into a condition of collapse, due largely or wholly probably to a continuous and persistent oozing hemorrhage from the seat of the operation. The wound was, therefore, packed, and the operation hastily concluded. The patient recovered fairly well and seemed to be in good condition on the next day. A microscopic section of a portion of the tumor removed proved to be a spindle-celled sarcoma (Dr. Singley).

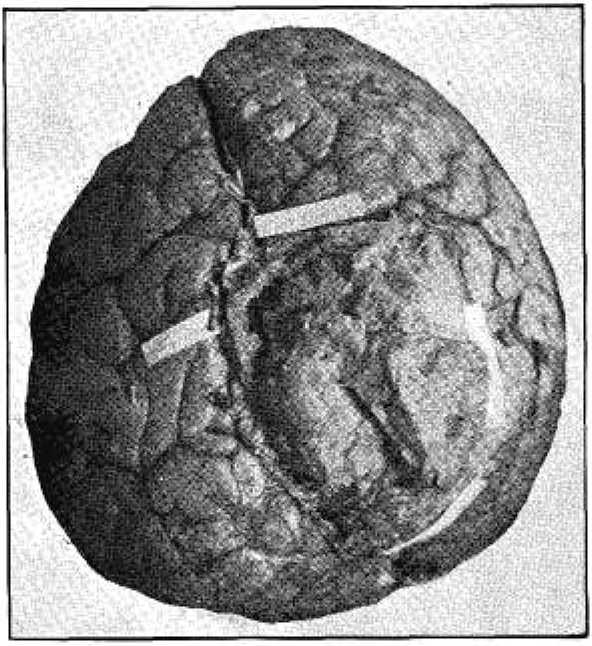
A second operation was undertaken by Dr. Stewart six days later, Drs. McKennan, Werder, Buchanan, Mayer, and others being present. As soon as the packing was removed a steady and persistent hemorrhage at once began, which repeated packings failed to control. An enlargement of the opening in the skull failed to reveal cerebral convolutions at any point. Dr. Stewart was, however, able to get his finger between the tumor and the brain structure and thought the growth extended in a forward direction. After the removal of a number of small pieces of the tumorous mass, the operation was again hastily terminated, since the patient was again going rapidly into a condition of collapse. He made an uneventful recovery from the second operation.

I examined the patient on July 25, 1901, when I found the wound well healed. He expressed himself as feeling brighter and happier than for several months past. He had resumed smoking, a habit he had given up some months before the operation because of a lack of desire for tobacco. Members of his family, too, regarded his mental condition as much improved. In the two months since the operation he had had two convulsive seizures of the usual type.

The patient lived a little longer than two years after this examination; but during this time he was not again examined by me. His family report, however, that for the most part he was fairly comfortable; that the convulsive seizures occurred with somewhat less frequency and severity than during the two years preceding the operation; that he was troubled with headache but seldom; and that he never vomited; that his eyesight seemed good; that he was hopeful, cheerful, and on the whole happy; that, although much improved mentally, a certain psychic reduction was noticeable; and that a certain degree of weakness of the left arm and leg was observable (more at some times than at others). In short, both the patient and his family felt that he had been much benefited by the operation.

Last January he developed an attack of pneumonia, and following convalescence from this illness considerable increase of his mental reduction was noticed; and from this time on loss of power in his right arm and leg, especially the latter, steadily increased and became very marked. However, only a few days before his death he walked about the neighborhood with the aid of a cane and visited some friends. With the aid of his glasses he was still able to read a newspaper. Although he seldom complained of headache, he often spoke of a fulness about the head.

FIG. 1.



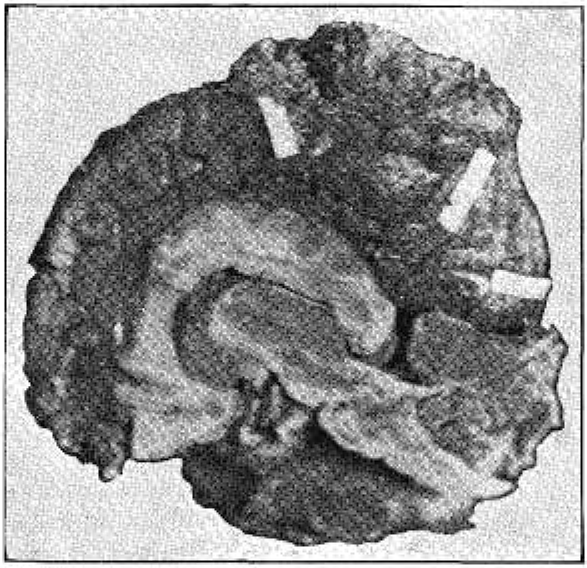
On July 31, 1903, he was seized with two general convulsions. Following the second attack coma developed, and death occurred on August 2d.

An *autopsy* was performed by Drs. Daggett, Litchfield, and myself sixteen hours after death. The scalp over the opening in the skull was found much depressed and united by thin cicatricial bands to the underlying structure, and these in turn to the tumor mass. Part of the tumor adhered to the skull-cap upon its removal.

The tumor was found to extend from the upper extremity of the Rolandic fissure to the parieto-occipital fissure, posteriorly. On the convexity of the brain it extended downward to the upper portion of the inferior parietal convolution. On the mesial aspect of the brain it extended down to the upper third of the gyrus fornicatus. It bulged beyond the median line, producing a large concavity on the mesial aspect of the opposite lobe, at one point, over the paracentral convolution, giving off two tit-like projections, which produced deep indentures in the corresponding convolutions of the left side. The tumor, therefore, involved the superior parietal, the paracentral, and quadrate convolutions chiefly and the inferior parietal convolution and the gyrus fornicatus also partially. No other tumor was discovered.

The tumor was dense in structure and easily palpable in the fresh specimen from the surrounding cerebral tissue, and about the size of a duck-egg. On section it offered great resistance to the knife. It was clearly defined from the brain tissue at all points. Immediately below the tumor, as shown by the section, the brain mass, for a depth of one inch, was somewhat softened.

Fig. 2.



Remarks. In brief, we have here a sarcomatous tumor, the size of a duck-egg, situated in the right superior parietal, quadrate and paracentral convolutions, which had probably been growing for at least five years.

The first year of its growth the tumor had produced symptoms of a neurasthenic character only, during which time its diagnosis would have been impossible. Fourteen months later Jacksonian epileptic attacks, with the signal symptom in the left great toe, began, and were maintained at intervals until death. Only three years later, or two years after the first of these attacks, did any other symptoms of the growth manifest themselves, the patient during this time being free from optic neuritis, headache, vomiting, vertigo, and cranial nerve palsies, the common symptoms of brain tumor; and so during this period a positive diagnosis of the growth was impossible. Nevertheless, even during this period the tumor had been strongly suspected. I saw the patient for the first time on November 14, 1899, with Dr. Litchfield, at that time the attending physician (*i. e.*, about nine months after the initial seizure). Dr. Litchfield had already reached the conclusion that the attacks of Jacksonian epilepsy were due to an organic lesion, situated in the motor cortical region for the left great toe, and had urged an operation, with a view of exploring this region, having proven antisyphilitic treatment useless. I concurred in this view. Had Dr. Litchfield's advice been acted upon at this time or shortly afterward, it seems to me not unlikely, if not, indeed, probable, that the growth would have been successfully removed, since we must suppose it was then much smaller than it was at the time of the operation, eighteen months later, and since the point at which it was then proposed to trephine would have discovered the growth. Indeed, nearly all the favorable features for a successful operation were then present, viz.,

FIG. 3.

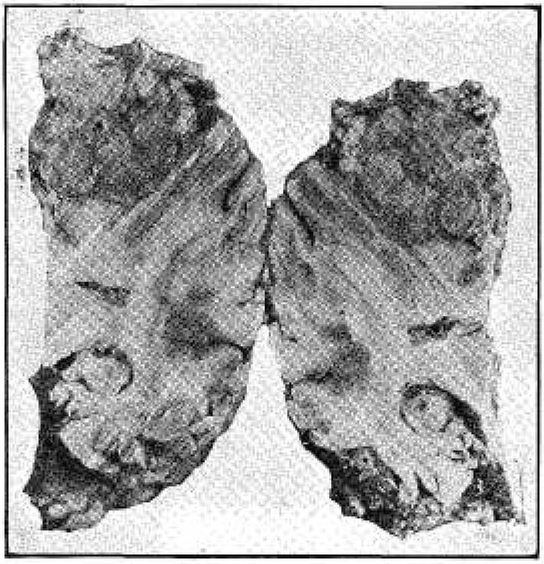
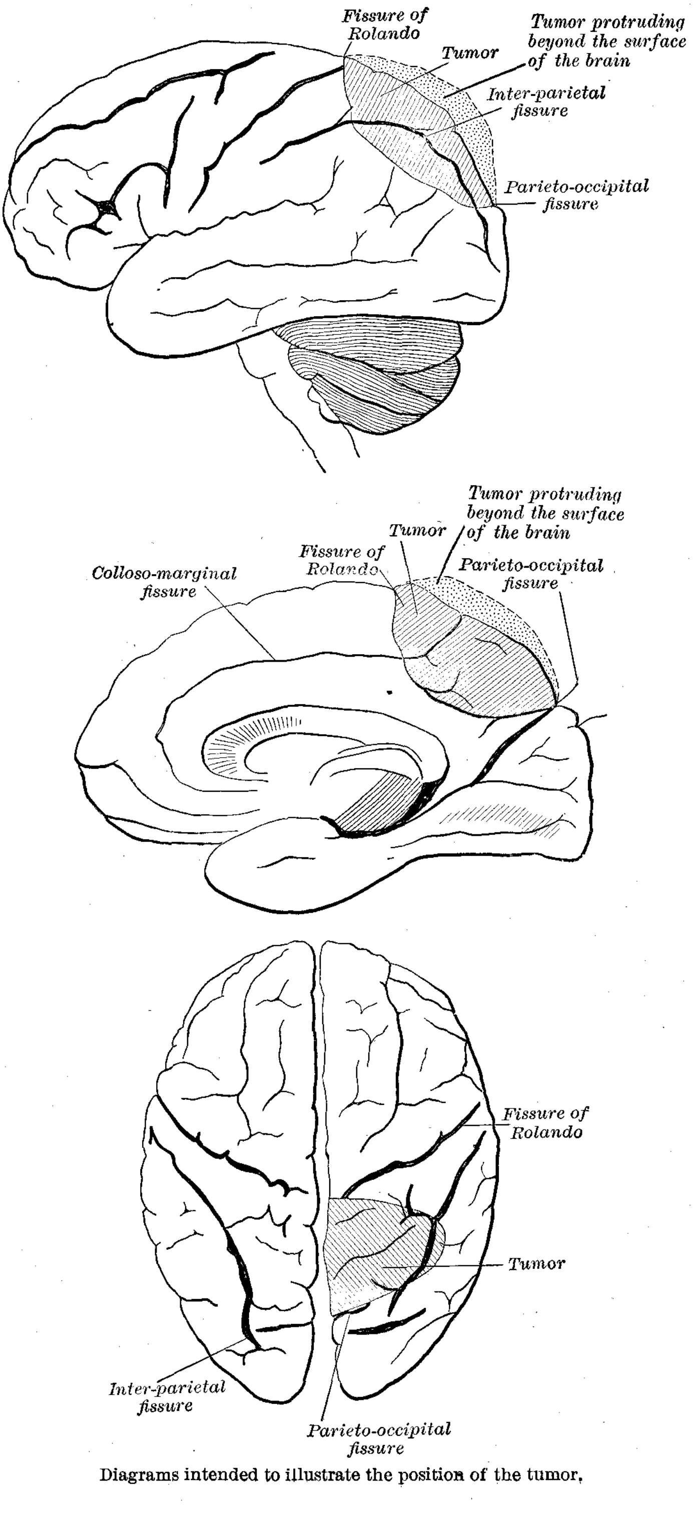


FIG. 4.


Fissure of Rolando
Tumor
Tumor protruding beyond the surface of the brain
Inter-parietal fissure
Parieto-occipital fissure
Tumor protruding beyond the surface of the brain
Tumor
Fissure of Rolando
Colloso-marginal fissure
Parieto-occipital fissure
Fissure of Rolando
Tumor
Inter-parietal fissure
Parieto-occipital fissure

Diagrams intended to illustrate the position of the tumor.

a single hard, circumscribed sarcoma, moderate in size, non-infiltrating and situated in one of the most accessible areas for surgical intervention, and in an area which permitted the maximum of certainty in localization by the clinician.

These same favorable features were present at the time the operation was undertaken, eighteen months later, except that the tumor was then doubtless larger. But, on the other hand, with the appearance of headache, optic neuritis, and stupor the probability that the organic lesion was a tumor had grown to a practical certainty.

Even as it was, one cannot escape a feeling of disappointment that the growth was not entirely removed at the operations, since even then it was still an unusually favorable one for surgical intervention. But I will say no more of the surgical aspect of the case, since Dr. Stewart has kindly consented to offer some discussion of this phase of the subject; his remarks are appended to this paper.

Although the character of the tumor was not diagnosed, yet consideration of two features pointed to sarcoma, viz., the slow growth of the tumor and the fact that sarcoma occurs more frequently than any other brain tumor in adults.[1] In a negative way the absence of carcinoma or tubercle in other parts of the body also lent support to this view.

As to the light this case sheds on cerebral localization, not a great deal can be said, because of the considerable size of the tumor, and since its exact starting-point cannot be known. In general, however, it conforms to the commonly accepted view that the cortical motor representation for the left great toe is situated in the opposite superior parietal convolution. It argues against the location of stereognostic appreciation taking place in this convolution. It also argues against the views of those who would place the motor cortical representation for the great toe in the superior precentral convolution—*i. e.*, anterior to the Rolandic fissure; and, on the contrary, it affords support to the views of those who localize this function in the superior parietal convolution, well back of the Rolandic fissure. It will be remembered that the tumor extended anteriorly only to the Rolandic fissure.

If we may judge by the bony protuberance on the skull, the growth began midway between the Rolandic and parieto-occipital fissure, next to the longitudinal fissure.

A noteworthy feature of the case was the absence of some and the late appearance and temporary character of other of the general symptoms of brain tumor. Headache was severe once only, in the attack just before the operation. Vomiting and vertigo were never symptoms. The optic neuritis probably subsided, since no appreciable defect of vision was present at any time after it was discovered. The third nerve palsy was, I believe, correctly interpreted at the time as a "distant symptom," and not due to direct involvement of this nerve or its nucleus.

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[1] Starr. Organic Nervous Diseases, p. 585.

One more point seems worthy of comment, viz., protrusion and erosion of the bone over the growth. The question arises in my mind, Was this due to the hard and unyielding character of the neoplasm which, by pressure, had shut off the blood supply to the superimposed cranial bone? It would seem so.

I am indebted to Dr. Litchfield for his notes on the earlier history of this case; to Dr. A. Létevé for the excellent photographs which illustrate this paper; and to Dr. R. W. Stewart for consenting to offer some discussion of the surgical aspects of the case. To each of these gentlemen I desire to express my thanks.

Remarks by R. W. Stewart, M.D.

The improvement, both in the mental and physical condition of this patient which followed partial removal of the tumor, makes it all the more regrettable that the whole growth was not enucleated. Had this been done, it is quite probable that there would have been a permanent recovery, as these growths are, as a rule, only semi-malignant in character and with but little tendency to infiltration.

The difficulty which I experienced with this case was the alarming hemorrhage following the attempt at removal of the growth, which apparently had opened the longitudinal sinus. The hemorrhage was so severe that the patient immediately went into collapse, and a fatal issue was only prevented by packing the cerebral cavity and the resort to hypodermic stimulation.

After the lapse of a week I was in hopes that the packing could be safely removed and the operation completed; but the attempt to do so was followed by exactly the same experience as in the former trial, and only a small portion of the tumor was removed at this time.

As the microscopic examination showed the tumor to be a sarcoma, and as no definite idea was obtained as to the limits of the growth, no further attempt was made to remove it.

The light shed on the case by the post-mortem evidence showed that the tumor was not inoperable, and I feel that I erred in two things. First, in not doing the operation in two steps as follows: First: removal of the skull over an area sufficiently extensive to expose the dura over the entire underlying tumor. The flap is then stitched back in position, and in the course of a week the second operation should be undertaken.

This consists in reopening the wound, incision of the dura over the entire extent of the tumor, and the control of all hemorrhages as the operation progresses. In this case it would probably have been necessary to ligate the longitudinal sinus at each side of the tumor. The tumor is then dissected out very much in the manner in which it is done in the post-mortem room, hemorrhage being controlled by ligation of the vessels as the operation progresses.

The chief advantage in doing the operation in two steps is that it minimizes the shock, which is the greatest danger confronting the patient. Had this been done and a sufficiently extensive area of the skull removed, it is probable that there would have been no opportunity for post-mortem findings in this case.

CONGENITAL CYSTS OF THE FOURTH VENTRICLE.[1]

A REPORT OF TWO CASES ASSOCIATED WITH TUMOR OF THE OPTIC THALAMUS AND CRUS CEREBRI.

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INTRODUCTION. The pathological conditions resulting in the formation of cysts within the fourth ventricle or a cystic dilatation of the ventricle are as follows:

1. Parasitic: Cysticercus or echinococcus cysts.
2. Cystic degeneration of a tumor.
3. Cystic degeneration of the choroid plexus.
4. Cystic dilatation of the fourth ventricle from occlusion of its communications.
5. Congenital cysts.

These are of pathological rather than clinical importance because of their rarity and the atypical character of the symptoms produced.

Both cases forming the subject of the present study are examples of brain tumor in young subjects with *congenital* cysts of the brain stem projecting into the fourth ventricle.

In both the intimate structural relation of cyst and tumor was demonstrable.

SUMMARY.

CASE I.—A boy, aged seven years, previously healthy, developed symptoms of brain tumor referable to the left optic thalamus. The important objective symptoms were: hemiparesis and hemiataxia of the right arm and leg; paralysis of the emotional innervation of the right side of the face; paresis of the left external rectus; nystagmus; hearing impaired on the right, both to aerial and bone conduction; no hemianopsia; no objective sensory disturbances.

Autopsy. Large tumor (mixed-cell sarcoma) situated in the left

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[1] Read in abstract at a meeting of the New York Neurological Society, January 5, 1904.